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# Fact Sheet

## Energy Conservation in the Rural Home

AFS-2-3-10

United States  
Department of  
Agriculture

### How to Install Insulation for Ceilings

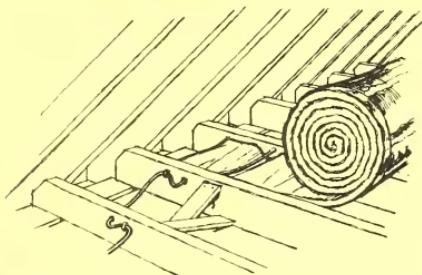
Inadequate insulation is the foremost cause of energy waste in the majority of American homes. People could save 20 to 30 percent of the energy used to heat their homes in winter and about 10 percent of the energy used to cool their homes in summer by insulating to an adequate standard.

The amount of energy you can save depends on where you live, the size of your house, and its construction. However, you can usually expect to pay for proper insulation in 3 to 5 years through energy savings.

#### Insulating the Uninsulated Ceiling

**Batts or blankets**—fibers woven into sheets for easy installation. The width of blankets and batts corresponds to standard stud spacings. Blankets are continuous rolls, which you hand-cut to a desired length. Batts are pre-cut to 4- and 8-foot lengths.

All insulation is rated as to its capacity to protect the temperature inside your home from extremes in temperature outside. It is given an R-value so the buyer can understand how effective an insulation is and be able to purchase exactly the amount required to do a job.<sup>1</sup> For an uninsulated ceiling, you will want to buy insulation with a R-value of 19.



<sup>1</sup> To find out how to determine your R-value requirements, consult "What to Look for in Selecting Insulation," Fact Sheet No. 2-3-13, U.S. Department of Agriculture.

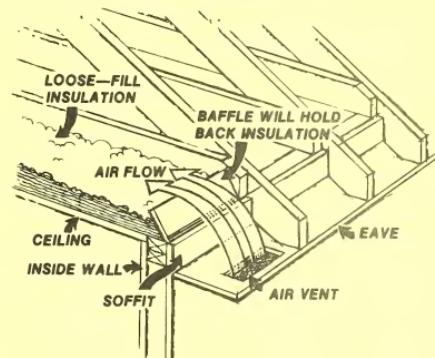
Lay the insulation between the attic joists with the vapor barrier facing down toward the rooms below. Start from the outer edges of the attic and work toward the center. This allows you to do any cutting or fitting in the center where there is more headroom.

You need not staple the insulation between the joints, just push it down to the ceiling, smoothing out the vapor barrier against the ceiling and joists.

Where cross-bracing prevents you from getting the batt down to the ceiling, cut the batt and fit it tightly above and below the bracing.

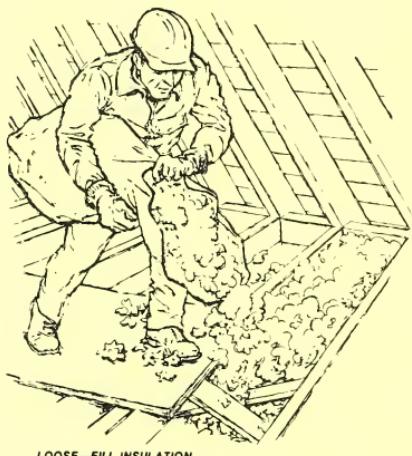
Cover the ceiling as close to the eaves as possible, but . . .

- Do not cover eave vents or block venting space along the eave of the roof.
- Do not cover recessed lighting fixtures or exhaust fan motors.
- Do not overlook any areas where there are heated areas below.



**Loose-fill insulation**—material that can be poured into place. The R-values of loose fill from different manufacturers vary considerably per inch of thickness. Check the label on the bag to find out how many bags to buy and how thick to pour the loose fill to get an R-value of 19. The label will show the thickness in inches required to obtain R-19 and the number of square feet the contents will cover at that thickness.

In calculating the number of bags that you will need, remember that the joists take up about 10 percent of the attic area. So multiply the attic area by 0.9 to find the number of square feet you will be covering. A house with 1,000 square feet of attic would have 900 square feet of area to be insulated. If each bag will cover 30 square feet at the required depth, you would need 30 bags to insulate the area.



LOOSE-FILL INSULATION  
SHOULD BE POURED INTO PLACE

Simply pour the insulation from the bag into the space between the joists to the required level and smooth it out with a rake or flat board. If parts of the attic are floored, you will have to push the insulation under the flooring. Cover all areas except the eave vents, recessed light fixtures, and fan motors. These should be boxed off to keep them out of contact with insulation, if flooring covers them, the space in the floor above the recessed fixture should be cut out and a metal vent installed flush with the floor surface.

If you're adding blankets or bats to existing insulation, use insulation with a value of at least R-11. If available, use unfaced insulation, one with no vapor barrier. If the unfaced kind isn't available, be sure to peel off the vapor barrier to avoid trapping moisture in the existing insulation. Lay the insulation between the joists on top of the existing insulation.

When using bags of loose fill, pour it between the joists on top of the existing insulation until the total depth is at least 6 inches. Loose-fill insulation can be applied on top of any other type of bats, blankets, or loose fill.



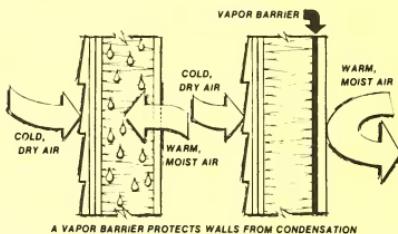
FOAM IS INJECTED  
THROUGH HOLES IN SIDING

**Blown fill**—unwoven fibers or plastic foams that are blown in with special pneumatic machinery by contractors. Blown fill can be applied to the same kind of attic areas as loose fill. It is also that only way of insulating between finished floors that overhang an outside area. It should be purchased with the same attention to its R-value as that given to purchases of loose fill. Blown-in plastic foams are best for overhanging areas, as they form their own vapor barriers.

### Vapor Barriers

Vapor barriers should be used with all types of insulation. These barriers are simply special backing materials—usually paper, plastic, or foil—that prevent the insulation and structural wood from dampening.

Batts and blankets can be purchased with vapor barriers already attached. For loose-fill insulation, vapor barriers can be improvised out of plastic sheeting available at any hardware store. In places where a vapor barrier cannot be installed—as in finished walls



A VAPOR BARRIER PROTECTS WALLS FROM CONDENSATION

being filled with "blown-in" insulation—the interior surfaces of the wall can be made vapor resistant with two coats of an oil-based paint or with wallpaper that contains plastic.

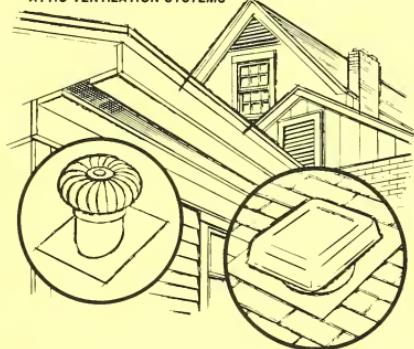
No matter what form of insulation or what kind of vapor barrier is used, remember to put the vapor barrier on the warm, or "lived-in" side of the space to be insulated. This keeps the moisture in the warm indoor air from reaching the insulation.

The objective is to avoid trapping moisture, which can cause structural and esthetic damage.

## Ventilation

Adequate ventilation is the second aspect of controlling moisture. No matter how well a vapor barrier is installed, some moisture from inside the house will permeate the insulation. To avoid having this moisture settle in the insulation and the surrounding wood, the exterior of the insulation (upper side in the attic) must allow moisture that does permeate to escape outward.

### ATTIC VENTILATION SYSTEMS



A well-insulated attic must be well ventilated to prevent moisture accumulation. Attic vents should be placed so that air can flow freely into one vent and out the other, thus providing good cross ventilation. A good rule of thumb for attic ventilation is to provide 1 square foot of unobstructed ventilation opening for each 300 square feet of attic floor area. Never cover or block vents with insulation. Care should be taken with loose-fill insulation to make sure that it doesn't shift into vents or eaves.

## Take Safety Precautions

If you do the job yourself, observe a few safety measures. Handling insulation can temporarily irritate your skin, so keep your shirt sleeves rolled down and buttoned, and wear a pair of work gloves.

If you're using loose fill, cover your nose and mouth with a piece of gauze or a handkerchief to avoid breathing flying dust. Never wear contact lenses when handling insulation.

Don't attempt to work in the attic on a hot sunny day. Temperatures can reach 140° F. Work in the morning or on a cool, cloudy day.

Finally watch out for any nails that stick through the roof sheathing above your head.

After you have finished the job, take a cold shower. The cold water closes your pores and washes off the insulation, preventing it from getting into the skin.

## Tools for the Job

1. A sharp knife or serrated kitchen knife to cut blankets or batts. A pair of scissors with long blades work equally well.
2. A straight edge to cut along. A length of board will do the trick.
3. A rake, bamboo is best, to spread out loose-fill insulation or a metal rake to push or pull blankets or batts to edge of the eaves.
4. A sheet of  $\frac{3}{4}$ -inch plywood to lay across the joists to walk on. When in the attic, don't step between the joists or your foot will go through the ceiling.
5. A portable light with plenty of extension cord to use if your attic isn't lighted or there are no windows.

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- AFS-2-3-2 Save Heating and Cooling Dollars with Weather-stripping and Caulking
- AFS-2-3-3 Tips on Financing Home Weatherization
- AFS-2-3-4 Solving Moisture Problems with Vapor Barriers and Ventilation
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Single copies are available upon request to Special Programs Center, Office of Governmental and Public Affairs, U.S. Department of Agriculture, Washington, D.C. 20250.

This series of fact sheets was assembled from research, Extension, and other sources by the USDA Task Force on Weatherization.

Issued August 1979  
Slightly revised March 1981

## Fact Sheet 2-3-10

United States Department of Agriculture  
Office of Governmental and Public Affairs  
Washington, D.C. 20250

\* U.S. G.P.O. 1981-725-754/705